



### Closing Ceremony Awards & Recognition

### Yan Lu Chris McComb Zhenghui Sha



ASME<sup>®</sup> 2020 IMECE<sup>®</sup> International Mechanical Engineering Congress & Exposition<sup>®</sup>

VIRTUAL CONFERENCE Nov 16–19, 2020



### Opening Remarks





#### Normal heartbeat

#### Deceased heartbeat



Waiting for test error during Hackathon





## **Awards & Recognition**

- The goal of the hackathon is "to build society-university-industry relations and impact the quality and quantity of data-skilled mechanical engineers."
- The hackathon was also bigger than a competition. It's also about building relationships, working on teams, trying something new, etc.
- Everyone learned something that's a win across the board!!
- 28 hours ago many of you started your first hackathon.
- Acknowledgement: Hackathon Organization Committee, Mentors, Judges, ASME Staff



YOU MUST PLAY BOLDLY TO WIN. - Arnold Palmer

Friendships born on the field of athletic strife are the real gold of competition. Awards become corroded; friends gather no dust.

- Jesse Owens

## **Awards & Recognition**

- Oh yeah, we have a variety of awards to discuss.
- 2020 IMECE Mechanical Engineering Memester Extraordinaire – 2<sup>nd</sup>, 1<sup>st</sup>
- Topic 1 winners 3<sup>rd</sup>, 2<sup>nd</sup>, 1<sup>st</sup>
- Topic 2 winners 3<sup>rd</sup>, 2<sup>nd</sup>, 1<sup>st</sup>





## **Awards & Recognition**

- 2020 Mechanical Engineering Memester Extraordinaire (MEME)
  - 2<sup>nd</sup> \$25
  - 1<sup>st</sup> \$50 & Bestowed as the 2020 Mechanical Engineering Memester Extraordinaire (MEME)

• Topic 1 winners

- 3<sup>rd</sup> \$500
- 2<sup>nd</sup> \$1,000
- 1<sup>st</sup> \$2,000



- Topic 2 winners
  - 3<sup>rd</sup> \$500
  - 2<sup>nd</sup> \$1,000
  - 1<sup>st</sup> \$2,000



#### Total: \$7,075, a bestowing, and lots of smiles





#### 2020 IMECE Mechanical Engineering Memester Extraordinaire

- Patrick Manser
- 16 votes in total!!





#### 2020 IMECE Mechanical Engineering Memester Extraordinaire

- Zhenghui Sha
- 21 votes total!!!





### **Topic 1 Generating an Interpretable Surrogate Model for Predicting Damage Accumulation**

Team name	Leader	Members	Affiliation/Institution	Problem #
SoloMid	Molla Hafizur Rahman	Micheal Dang, Nhat Le	University of Arkansas	Generating a Data-Driven Surrogate Model for Machine Damage Accumulation
Octopus	Laxmi Poudel	Madan Dahal; Bi Foua	University of Arkansas, Arkansas Tech	Generating a Data-Driven Surrogate Model for Machine Damage Accumulation
Decision Trio	Kristen Edwards	Lyle Regenwetter, Amin Heyrani Nobari	Massachusetts Institute of Technology	Interpretable Predictions of Damage Accumulation through Transformers
Utah	Keven Carlson	Karl Garbrecht	University of Utah	Symbolic Regression for Interpretable Surrogate Models
MGP	Sam Lim	Daniel Lee; Vaishnavi Addala	Purdue University, MIT, Georgia Tech	Predict Damage with a Hybrid Model
DataMiners	Joan Madera	Ayrton Moyon; Jose Azucena	ASME	Generating an Interpretable Surrogate Model for Predicting Damage Accumulation in Manufacturing







#### Professor: Fit the model. Student:



- Team Utah (Keven Carlson, Karl Garbrecht)
- R<sup>2</sup> = 0.40 (as measured on holdout testing data). Third highest R<sup>2</sup> value of all teams.
- Good job of achieving useful accuracy with a relatively simple model.







- Decision Trio (Kristen Edwards, Lyle Regenwetter, Amin Heyrani Nobari)
- R2 = 0.64 (as measured on holdout testing data). Second highest R^2 value of all teams.
- Very strong presentation and use of attention-based transformer.





# Topic 1





- Team MGP (Sam Lim, Daniel Lee, Vaishnavi Addala)
- **R2 = 0.89** (as measured on holdout testing data). This was **the highest**.
- Good job relating physics to the results shown



### **Topic 2 Melt-Pool Size Prediction for Powder-Bed Fusion Additive Manufacturing (PBF AM)**

Team name	Leader	Members	Affiliation/Institution	Problem #
UMMS	Zhuo Wang	Wenhua Yang	University of Michigan-Dearborn; Mississippi State University	Using machine learning to improve melt pool prediction in additive manufacturing: data denoising and predictive modeling
XiaoXiao Sun	Yinshuang Xiao	Qingyu Xiao; Xiaotong Sun	University of Arkansas	Melt-Pool Size Prediction for Powder-Bed Fusion Additive Manufacturing
Melt Pool-Aid	Upayan Mathkari	John Mellinger, Rumman Ahsan	UT Austin, Tennessee Tech	Prediction of melt-pool size in laser powder based fusion (LPBF) additive manufacturing (AM)
GRAIL	Zhibo Zhang	Chandan Kumar Sahu	University at Buffalo	Smart Manufacturing Melt-Pool Size Prediction for Powder-Bed Fusion Additive Manufacturing
Octopus	Laxmi Poudel	Madan Dahal; Bi Foua	University of Arkansas, Arkansas Tech	SMART MANUFACTURING – MELT-POOL SIZE PREDICTION FOR POWDER-BED FUSION ADDITIVE MANUFACTURING









- Team XiaoXiao Sun: Yinshuang Xiao, Qingyu Xiao; Xiaotong Sun
- Score: 69 RMSE: 0.00277
- Judge's review: This team preprocessed the raw data using SVD which seems an effective method.



### **Topic 2**





- Team GRAIL: Zhibo Zhang, Chandan Kumar Sahu
- Score: 82.33 RMSE: 0.0038
- Judge's review: GRAIL team did an excellent job in the data visualization, as well as the integration of physics-based models and machine learning models to tackle this hackathon challenge; Combining physics and machine learning is novel.



### **Topic 2**



- Team UMMS: Zhuo Wang, Wenhua Yang
- Score 82.67 RMSE 0.0022
- Judge's Review: Good review of external papers. Used 'turning points' as a feature; very relevant to physics. Pre-processing was further than expected (they removed 'attached' particles as well as detached).





CIE SEIKM TC: Yan Lu, Zhuo Yang, Dazhong Wu, Bryan O'Halloran, and Zhenghui Sha

**Topic Area Mentors**: Chris McComb, Zhenghui Sha, Binyang Song, Yan Lu, Zhuo Yang, Ho Yeung, Dehao Liu, Faez Ahmed, Anh Tran

ASME Staff: Barbara Zlatnik, Andrew Koleba, and Timothy Graves

IMECE Conference Organizing Committee: Chris Depcik and Marriner Merrill

MED Division Executive Committee Representatives: William Emblom and Radu Pavel

TEC Council Representatives: Gloria Wiens (DMM), Stephen Reese (DMM), and Mina Pelegri (ESS)

#### Judges:

Brandon Lane: NIST: National Institute of Standards and Technology Dazhong Wu: University of Central Florida Hui Yang: Penn State University Anant Mishra: Siemens Rahul Rai: The University at Buffalo – SUNY Binyang Song: Penn State University



### Closing Remarks



Transfer

Learning

#### **Melt Pool Size Prediction**



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р

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